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Dual task engages an independent executive function

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two cognitive tasks (e.g. monitoring cooking pots whilst listening to the news), a cognitive task and a motor task (e.g. holding a conversation whilst walking), or two motor tasks (e.g. carrying a tray whilst walking). In recent years studies have shown that patients with a number of different neurological disorders, including Alzheimer's disease, stroke, head injury and Parkinson's disease, show disproportionate impairment when dual-tasking compared to single task performance. However the mechanisms that cause such deficits are not fully understood. Dual-task paradigms are therefore of theoretical and clinical value, helping us better understand the nature of attentional control that underlies the ability to do more than one thing simultaneously and the practical difficulties of patients. This symposium will address theoretical, clinical and methodological aspects of dual-task performance. Papers will: present evidence that dual-tasking reflects an independent and separable component of working memory (Foley et al); present evidence for the presence of dual-task deficits in clinical conditions in which such deficits have not previously been described (Hamilton et al. and Paul et al.); present evidence that measures of dual-tasking may provide a clinical marker for the early detection of Alzheimer's disease (McPherson et al.); and illustrate how dual-task conditions may offer a better insight in the everyday difficulties with activities of daily living in patients with Alzheimer's disease (Kinsella et al.).

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

F. HAMILTON, L. ROCHESTER, L. PAUL, D. RAFFERTY, C.P. O'LEARY & J.J. EVANS. Walking and Talking: Cognitive-Motor Dual-Tasking in Multiple Sclerosis.

Objective: Problems with walking and with attention are known to be prevalent in Multiple Sclerosis (MS), though no studies have reported how these two difficulties might interact. This study investigated the effects of performing a concurrent cognitive task when walking in MS to determine the effects of task demand on dual-task performance.

Participants and Methods: Eighteen participants with MS and 18 healthy controls took part. Participants completed walking and cognitive tasks under single and dual task conditions.

Results: MS participants, compared to healthy controls, had greater decrements in performance under dual-task conditions, including decrements in cognitive task performance, walking speed and swing time variability. In the MS group, the degree of decrement under dual-task conditions was related to levels of fatigue, a measure of general cognitive functioning and self-reported everyday cognitive errors, but not to measures of disease severity or duration.

Conclusions: We suggest that difficulty with cognitive-motor dual-tasking may lead to practical problems in everyday life including potentially increasing the risk of falls. Clinical tools to assess cognitive-motor dual-tasking ability are needed.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

J.A. FOLEY, K. INASARIDZE, R.H. LOGIE & S. DELLA SALA. Dual Task Engages an Independent Executive Function.

Objective: Dual-tasking is the ability to perform two tasks simultaneously. There are ongoing debates as to the cognitive constructs underlying dual task performance, and the circumstances under which there are, or are not performance costs of dual compared with single task performance. In studies reporting no, or very small costs of dual task in healthy adults, performance is thought to be supported by an executive function within a multiple component model of working memory. This study investigated the nature of these cognitive processes by using a measure of dual tasking and several measures of working and episodic memory.

Participants and Methods: 120 healthy people particpated. The dual task paradigm consisted of two tasks, a digit recall task, titrated to individual digit span, and a tracking task. As the dual task paradigm is titrated, it assesses the ability to coordinate performance on two demanding tasks independently of individual performance on single task. The measures of working and episodic memory were working memory span, digit span, immediate recall of Verbal Paired Associates and immediate recall of Word List Learning (both from the WMS-III).

Results: There were no significant correlations between dual task performance and any of these measures of working or episodic memory. There was a very small cost for dual task and dual task performance was internally highly reliable.

Conclusions: Results suggest that dual tasking reflects an independent and separable function of working memory.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

L. PAUL, B.M. ELLIS, G.P. LEESE, A.K. MCFADYEN & B. MCMURRAY. The Effect of a Cognitive or Motor Task on the Gait Parameters of those with Diabetes, with and without Neuropathy.

Objective: To investigate the effect of a motor or cognitive task on the gait parameters of older people with diabetes (DM) and people with diabetes and diabetic peripheral neuropathy (DPN).

Participants and Methods: Thirty subjects were recruited; 15 with DPN (mean age 69 ±3.0years) and 15 with diabetes and no neuropathy (70 ± 2.9years). The temporal and spatial parameters of gait were evaluated using the GAITRite walkway. Subjects undertook four walks under normal walking conditions (single task); four times while simultaneously undertaking an additional motor task, carrying a tray with cups of water (dual task); and four times whilst undertaking a cognitive dual task, counting backwards in sevens. This arithmetic task was also completed in sitting.

Results: In general the secondary task had a significant and adverse effect on the gait parameters and this effect was greater for those with DPN in both absolute and relative terms. Both groups had poorer arithmetic ability when walking compared to sitting and the DPN group spilled more water during the motor task compared to the DM group.

Conclusions: Patients with DPN have a more conservative gait pattern, which is partly maintained by cognitive attention. Problems with divided attention when walking were more present in both groups, DM and DPN, but were more evident in the DPN group and may increase their risk of falls.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

S.E. MACPHERSON, M.A. PARRA RODRIGUEZ, S. MORENO, F. LOPERA & S. DELLA SALA. Dual Task Abilities in Alzheimer's Disease due to E280A Single Presenilin-1 Mutation.

Objective: Our previous work has demonstrated that patients with sporadic Alzheimer's disease (AD) are impaired in their ability to perform two tasks simultaneously compared to healthy controls, despite being able to successfully perform the tasks alone relatively well. Yet, it remains unclear what the earliest clinical manifestation of this dual task coordination deficit is. In this talk, our recent work examining dual task abilities in individuals who are at risk of early-onset familial AD due to an E280A presenilin-1 mutation will be discussed. The aim was to investigate whether the dual task paradigm can differentiate between those asymptomatic family members who test positive for the gene mutation and family members who test negative for the gene mutation.

Participants and Methods: Twelve patients with mild AD, 25 asymptomatic carriers and 33 non-carriers of the gene mutation were asked to perform digit recall accompanied by a secondary tracking task.

Results: Despite performing well on a variety of neuropsychological measures, including episodic memory tasks, the asymptomatic carriers show dual task decrements compared to those family members without the gene mutation.